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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/779,749	02/18/2004	Yoshihiro Kimura	H6808.0040/P040	2045
24998	7590	06/02/2005	EXAMINER	
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP			JOHNSTON, PHILLIP A	
2101 L Street, NW			ART UNIT	
Washington, DC 20037			PAPER NUMBER	
			2881	

DATE MAILED: 06/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/779,749

Applicant(s)

KIMURA ET AL.

Examiner

Phillip A. Johnston

Art Unit

2881

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 09 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 2-18-2004.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

***Detailed Action***

***Claims Rejection - 35 U.S. C. 112***

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. For example, paragraphs [0034]-[0036] of applicant's published specification U.S. Patent Pub. No. 20040222375, state as follows; [0034] FIG. 3 shows line and space images and an edge profile peak portion of these images. Numeral 304 designates a cross section and 305 designates a plan view. The images and profiles of the embodiment are all so-called top-down images where the conventionally used charged particle is incident on the sample perpendicularly.

[0035] In the profile of FIG. 3, the boundaries between the lines and spaces in image 304 appear as portions 301 with high secondary electron intensities in image 305, and they form peaks 302 in the profile data. When attention is focused on the foot of the peak 302, and the shapes of a foot portion 303L towards the line and a foot portion 303S towards the space are compared, it is seen that the foot portion 303L towards

the line tends to transition to the base of the profile at a slower rate, due to the influence of the secondary electrons or reflected electrons from the edge side walls. [0036] Thus, the peak shapes are asymmetric about their respective peak vertexes. The profile waveforms of the line (convex) portions converge more gradually at the foot portion than the profile waveforms of the space (concave) portions. Conversely, the foot portions of the space profile waveforms converge more steeply than the foot portions of the line profile waveforms. In the present embodiment, the surface concavity and convexity on the sample are determined based on this principle. See also Figures 3A -3C below.



FIG. 3A

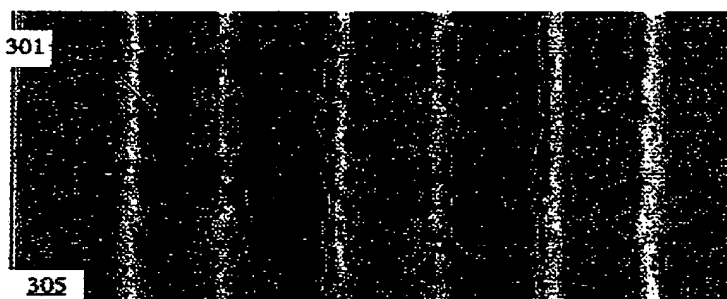


FIG. 3B

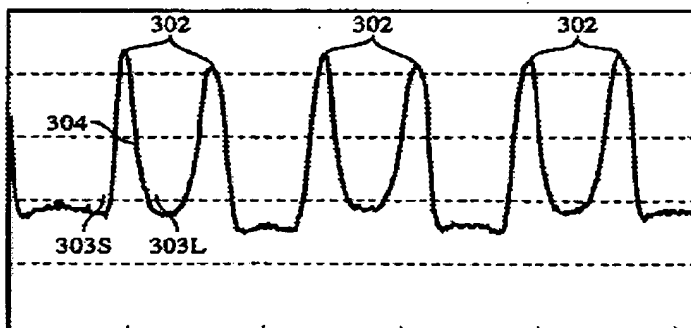
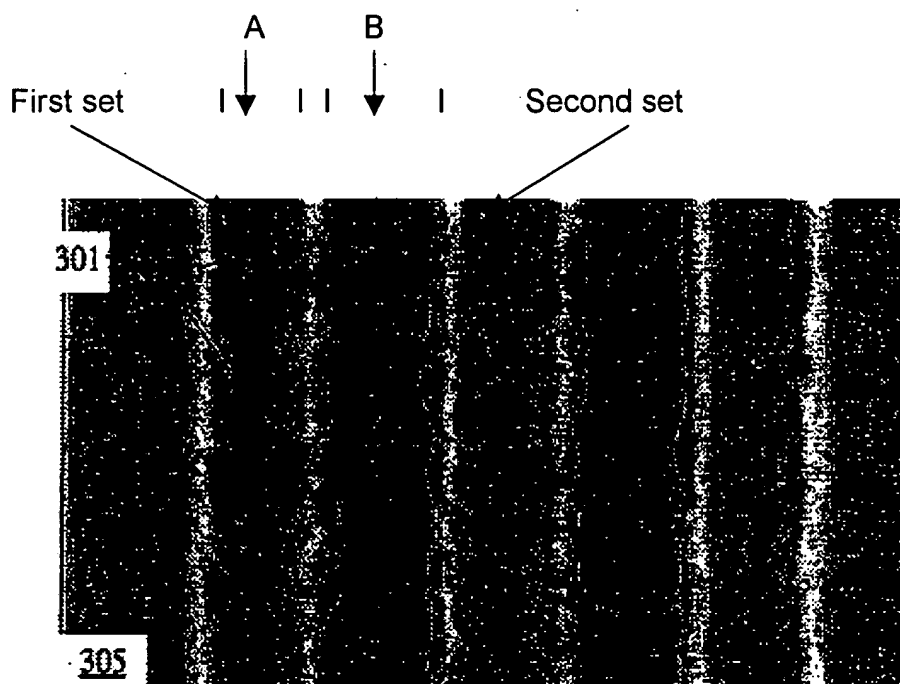


FIG. 3C

During the examiners construing of the claims in light of figures 3A through 3C the following observations were made;

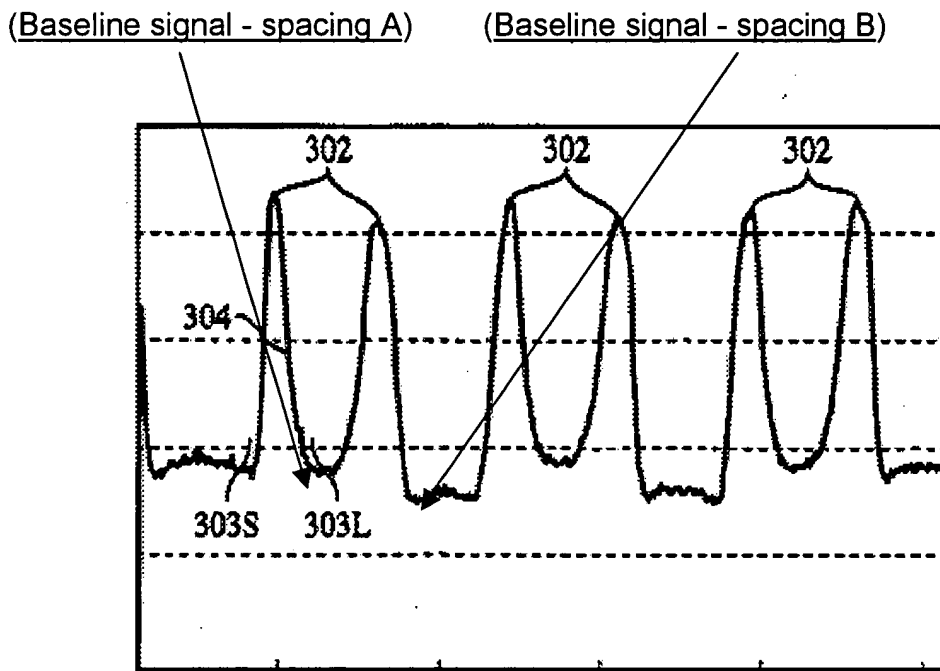
As stated above in paragraph [0036] above, the lines are the convex portions and the spacings are the concave portions.

The repetitive pattern of the lines in Figure 3B, has a first set of two lines with spacing A between them, followed by spacing B, and then a second set of two lines with spacing A between them, followed by spacing B; etc., and spacing B is larger than spacing A. It also appears that the size of the spacing B between adjacent lines varies, the far left being largest.



**FIG. 3B**

Figure 3C shows the results of beam scanning the pattern in Figure 3B, wherein two peaks 302 were observed for each set of two lines and a baseline signal level between the peaks representing spacing A, followed by a baseline signal level representing spacing B, followed by a second set of peaks 302 and so on across the pattern.



**FIG. 3C**

More importantly, for each pair of peaks 302 in Figure 3C, the inside foot 303L of each peak located adjacent spacing A between the pair of peaks 302, appears to converge more gradually than the outside foot 303S of each peak located adjacent any spacing B.

It also appears that the variations in width of repetitive spacing B observed in Figure 3B are likewise faithfully reproduced in Figure 3C.

Therefore, since the applicant has stated in paragraph [0035] relative to Figure 3C that, the foot portion 303L which transitions to the base of the profile at a slower rate, is the result of influence of the secondary electrons or reflected electrons from the edge side walls, conversely then the absence of edge side wall influence should result in a more steeply converging foot portion 303S, which appears to occur. From the sections of the specification discussed above the applicant has defined in claim 1 the limitation, "wherein, when one foot portion of said peak converges more gradually than the other foot portion thereof, a portion of said sample corresponding to said one foot portion is determined to be a convex portion." As well as the claim 2 limitation, "wherein, when one foot portion of said peak converges more steeply than the other foot portion thereof, a portion of said sample corresponding to said one foot portion is determined to be a concave portion."

However, the applicants use in paragraph [0035] of the influence of the secondary electrons or reflected electrons from the edge side walls to define the rate of convergence of the foot of each peak, and therefore convexity and concavity of claims 1 and 2 is ambiguous. For example, in Figure 3C above, the steeply converging foot 303S is clearly the left edge of the first pair of lines 302, which is a convex portion, and gradually converging foot 303L is clearly the right edge of the first line, which is a concave portion, since it is adjacent spacing A.

Further it would appear that it is proximity of adjacent line pairs 302 to each other that produces the gradually converging foot 303L via the influence of the secondary electrons or reflected electrons from the edge side walls to each lines peak, while the

absence of proximity to an adjacent line produces the steeply converging foot via the absence of any influence of the secondary electrons or reflected electrons from the edge side walls of an adjacent line.

In the rejection that follows, it has been assumed that claims 1-11 refer to a pattern line scan resulting in a waveform having a peak for each line, with two foot portions one on each side of the peak, and the rate of convergence of each foot portion (or the slope of the peak sides) is proportional to the relative magnitude of secondary and reflected electrons detected from the line material, wherein the foot portion that slowly transitions to the base is determined to indicate the presence of line material, and the foot portion that rapidly transitions to the base is determined to indicate the absence of line material.

***Claims Rejection - 35 U.S. C. 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-11 are rejected under 35 U.S.C. 102 (b) as being clearly anticipated by Archie, U. S. Patent No. 5,969,273.

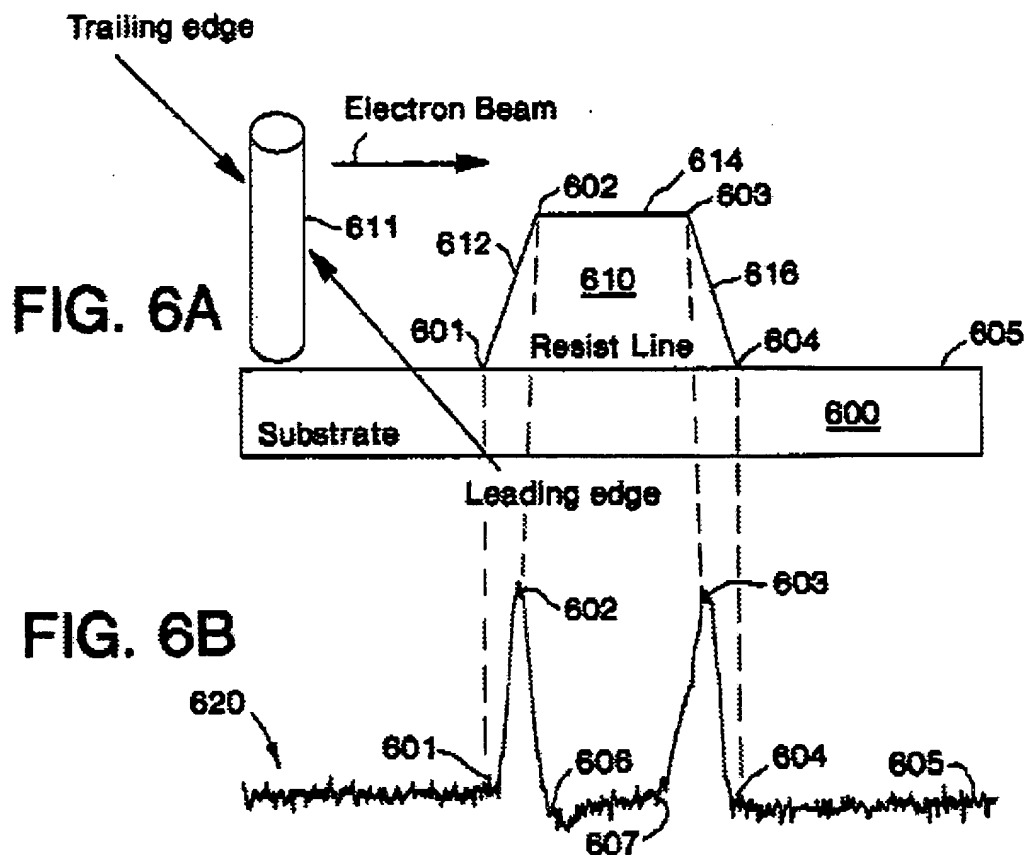
Archie (273) discloses the following;

(a) Using a commercially available SEM to perform an e-beam scan across a resist line (convex pattern); forming a profile waveform of escaped electrons



(secondary and reflected electrons), having a peak, as recited in claims 1-4, and 11.

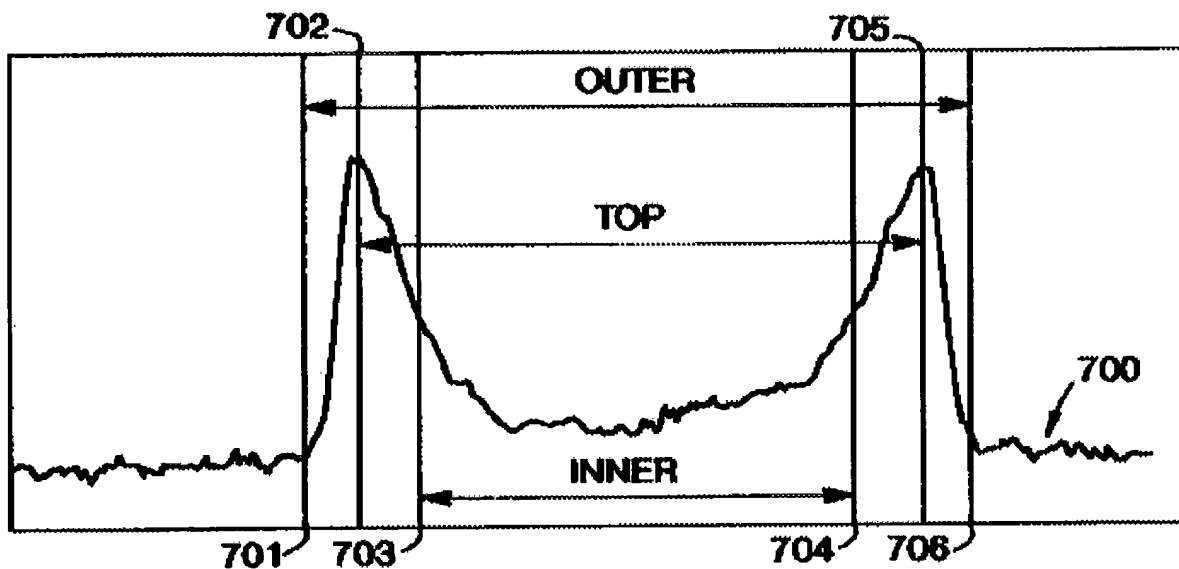
See Column 5, line 43-67; Column 6, line 1-33; Figures 6A, 6B, and 7 below.



It is important to point out here that as the width of the resist line 610 becomes smaller, a single peak representative of the line width occurs as shown in applicants Figure 3C above.

(b) A waveform peak 702, which has steeply sloped regions on either side and one side slopes more steeply to the bottom (foot portion) than the other, where the waveform shape 700 is representative of the resist line (a convex feature). the regions adjacent the peak regions; i.e., from 701 to 702, and 705 to 706, are regions where the

secondary electron signal amplitude is increasing sharply over the baseline amplitude of the substrate, which are equivalent to regions 303S and 303L in applicants Figure 3C above, as recited in claims 1-4, and 11. See Column 6, line 9-33.



**FIG. 7**

(b) The use of maximum slope to define the dimensions of a feature, and determining feature dimensions relative to a stored threshold value, as recited in claims 5-9. See Column 5, line 43-67; Column 6, line 1-33;

(c) One of ordinary skill recognizes that the locations of the points 701-706 may be determined by computing the derivative of the waveform 700, to determine the slope, and selecting the points at which the difference between the slope and the maximum slope reaches a threshold value, as recited in claim 10. See Column 6, line 23-33.


***Conclusion***

5. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached on Monday-Friday from 6:30 am to 3:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor John Lee can be reached at (571) 272-2477. The fax phone number for the organization where the application or proceeding is assigned is 703 872 9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PJ

May 27, 2005

  
JOHN R. LEE  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800